Human AI teaming Knowledge and Understanding for aviation safety

Haiku

Enhanced dialog for Human-Autonomy Teaming A breakthrough approach

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The problem we're facing



- Technology evolves, ... It's not new...
- But its evolution is faster than ever and it's accelerating



- Spreading through our daily lives, professional and personal
- So far, we're keeping up with it because of its intuitiveness, thanks to UX and HF knowledge on interaction





130h 500h





The problem we're facing



- But all that efficiency is threatened when there is a communication breakdown between operator and technology, because of :
 - Unpredictable failure (system)
 - Unpredictable event (situation/environment)
 - Operator cognitive resources impairment (fatigue, illness, ageing, ...)

QUID PRO QUO

The operator doesn't know what the system is doing...

The system can't figure out what the operator wants...

... No HMI is designed to resolve that situation



The problem we're facing



- At that point extra knowledge would be necessary to overcome the situation
- We're reaching a point where we won't have time to learn enough to master that depth of specific knowledge
- At some point it is becoming unrealistic for an operator to master the hidden complexity of over-complex systems
- "Let's google it and find a video tutorial" on how to... without understanding !
- Let me explain ...



Training time (% of 8h a day) per Task complexity





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We need an interpreter !







What about chat-GPT ?





« Give me the best green trajectory for my Airbus A320 between Bordeaux and Paris CDG»

Here are **some general strategies for a more eco-friendly flight**:

- **Direct Routing:** Plan a direct route between Bordeaux and Paris Charles de Gaulle to minimize the total distance flown. This helps reduce fuel consumption and emissions associated with climbing, descending, and maneuvering.
- **Efficient Climb and Descent:** Opt for optimized climb and descent profiles to minimize fuel burn. Follow air traffic control instructions for altitude changes, and consider continuous climb and descent when feasible.
- **Cruise Altitude Optimization:** Consult with the airline's dispatch team to determine the most fuel-efficient cruising altitude for the given flight conditions. Higher altitudes generally result in lower fuel consumption due to reduced air resistance.
- **Speed and Thrust Management:** Follow recommended speed and thrust settings provided by the aircraft manufacturer and the airline's operational guidelines. Maintaining optimal speed and thrust levels helps minimize fuel consumption.
- Weather and Wind Considerations: Take advantage of favorable winds during the flight planning phase, when possible, to reduce fuel burn. Air traffic control may also provide updated wind information during the flight, allowing for adjustments to optimize the trajectory.
- **Continuous Descent Approach (CDA):** If conditions and air traffic permit, consider a continuous descent approach into Paris Charles de Gaulle. This approach minimizes the need for level-off segments and excess thrust, resulting in fuel savings.
- **Single-Engine Taxiing:** When taxiing on the ground, use a single engine whenever possible to reduce fuel burn and emissions. However, safety and operational considerations take precedence, and aircrew will determine the appropriate engine configuration for taxiing.

Remember, these are general guidelines, and it's essential to follow the instructions and recommendations of your airline, aircraft manufacturer, and air traffic control to ensure safe and efficient operations.



The concept: bidirectional communicator 🤧 Haiku (Com-Bi in french)









Examples of AI assisted assistance feedback





Path optimisation for image capture



Global optimization with several tasks



Multi-actor and Multiobjective synchronization



Enabling "Human intentions" interpretation at system level















Key Performance Indicators (KPIs) to evaluate solvers Output







Upward Translator

is adjusted via supervised "machine learning" based on a collection of operational data







Downward Translator

- Translates operational intentions regarding function parametrization to optimize research space
- Allows to realize **an a priori filtering** for possible solution







Take Away and expected benefits



- > Let the system deal with complexity
- Need for an interpreter between operator and complex system

- COMBI is a breakthrough solution based expert knowledge and machine learning algorithms
- COMBI is a layer between end-user and AI based services
- COMBI is suitable for any complex human-machine technologies and domains
- COMBI is based on high level communication using operator intentions (domains specific)
- COMBI is applicable to cockpit, ATM, UAM, Airport management domains and beyond to facilitate interpersonal exchanges



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Thanks for your attention

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